भारतीय मानक **IS 9694 (Part 1) : 2023**

Indian Standard

कृषि अनुप्रयोगों के लिए क्षैतिज सेन्ट्रीफ्यूगल पम्पों के चयन, स्थापना, संचालन और रखरखाव — रीति संहिता

भाग 1 चयन

(दूसरा पुनरीक्षण)

Selection, Installation, Operation and Maintenance of Horizontal Centrifugal Pumps for Agriculture Application — Code of Practice

Part 1 Selection

(Second Revision)

ICS 23.100.10

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भारतीय मानक ब्यूरो
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March 2023 **Price Group 8**

Pumps Sectional Committee, MED 20

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by Pump Sectional Committee had been approved by the Mechanical Engineering Division Council.

One crop a year based on annual rainfall is now almost a past history in India. Canal irrigation and pumping sub-soil water now enables Indian farmers to get almost three crops per annum in most of the States of the country.

The gravity flow canal water to the fields can be regulated easily to cover various types of crops requiring different quantities of water at different watering intervals. However, in case pumps are used for lifting water to the fields from rivers, canals, ponds, wells and underground streams, the rate of flow of the pump has to be determined beforehand for selecting proper pumpset. The farmer has also to decide which type of pump, that is, horizontal, centrifugal, vertical turbine or submersible would be most suitable for economical use in his field.

This standard was first published in 1980 and subsequently revised in 1987.

In the first revision the conveyance losses have been reduced to 10 percent, and friction losses (C–Grade) for pipes have been taken as 140 and 150 for GI and RPVC pipes, and the resistance coefficients for valves and fittings modified.

This revision has been taken up to keep pace with the latest technological developments and practices followed in pumps industry. This revision incorporates the following major changes:

A reference clause has been added mentioning the latest version of all the referred standards and editorial changes have been made.

The composition of the committee responsible for the formulation of this standard is listed in Annex E.

The code of practice for the selection, installation, operation and maintenance of horizontal centrifugal pumps for agriculture application is in four parts. This standard covers the selection of pump. Other parts in this series under the general title are as follows:

Part 2 Installation
Part 3 Operation
Part 4 Maintenance

Indian Standard

SELECTION, INSTALLATION, OPERATION AND MAINTENANCE OF HORIZONTAL CENTRIFUGAL PUMPS FOR AGRICULTURE APPLICATION — CODE OF PRACTICE

PART 1 SELECTION

(Second Revision)

1 SCOPE

This standard specifies that the general guidelines for the selection of horizontal centrifugal pumps for agricultural applications, excluding submersible and vertical turbine pumps.

2 REFERENCE

The standards listed below, contain provisions which, through their reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards below:

IS No.	*Title*
IS 1239 (Part 1) : 2004	Steel tubes, tubulars and other wrought steel fittings — Specification: Part 1 Steel tubes (*sixth revision*)
IS 2951 (Part 2) : 1965	Recommendation for estimation of flow of liquids in closed conduits: Part 2 Head loss in valves and fittings
IS 4985 : 2021	Unplasticized PVC pipes for potable water supplies specification (*fourth revision*)
IS 10804	Recommended pumping systems for agricultural purposes:
(Part 1) : 2018	Surface pumps (*third revision*);
(Part 2) : 2018	Submersible pump sets (*third revision*)
IS 10805 : 2022	Foot-valves, reflux valves or non-return valves and bore valves to be used in suction lines of agricultural pumping systems — Specification (*second revision*)

3 SELECTION CRITERIA

The following major points shall be considered while selecting a pump:

a) Water requirement;
b) Water source; and
c) Operating conditions.

3.1 Water Requirements

For the correct selection of a pump, the quantity of water required to irrigate the field shall be known. This quantity depends on:

a) Type of soil;
b) Type of crop;
c) Size of the field; and
d) Conveyance losses of water, and local climatic conditions.

3.1.1 The general guidelines for irrigation requirements of some of the crops are given in Annex A for information.

3.1.2 Table 1 gives the area of land irrigated in 8 hrs pumping. This table also indicates the rate of flow in l/s for obtaining the required depth of water in 8 hrs of pumping.

3.1.2.1 To allow for conveyance losses of water flowing from the pumps to the fields, it may be advisable to increase by appropriate percentage up to 10 percent the quantity of water required as calculated from Table 1. A worked out example is given in Annex B.

3.2 Water Source

The following are the major sources from where water can be taken for irrigation purposes:

a) Rivers;
b) Canals;
c) Wells;
d) Ponds; and
e) Water stream.

3.2.1 *Pumps for Different Site Conditions*

If the water has to be brought to the fields from a nearby river or a stream or anallah, a horizontal centrifugal pump shall be installed by the side, if there is no appreciable seasonal fluctuations in the water levels. Select the position of pumpset at site in such a way that centre of suction branch is as close to the highest water level as possible. It is recommended to install the pump in such a way as to limit the maximum manometric suction lift to 6 m. If these values are exceeded on any installation, the pump would give reduced rate of flow, develop reduced total head, run on lower efficiency and would get damaged due to cavitation and vibration.

3.2.1.1 If the water level is likely to be such that the recommended total suction lift is exceeded at any time, the pump may run with 'cavitation' or may not discharge water at all. In such cases, where the total suction lift cannot be limited to recommended value, other types of pumps such as vertical turbine or submersible pumps may be used.

3.2.1.2 The suction lift is to be reduced for higher altitudes at the rate of 1.15 m for every 1 000 m above sea level. The temperature correction shall be obtained from steam tables.

3.2.1.3 Centrifugal pumpsets are available as direct coupled units using flexible couplings between the pumps and their prime movers, that is, electric motors or diesel/petrol/kerosene engines, spark ignition engines, etc. and mounted on base plates. These pumpsets can also have a common shaft between each pump and its prime mover dispensing with the use of flexible coupling and base plates, at the same time eliminating all alignment problems between the pumps and their prime movers. Such pumpsets are also known as monosetpumpsets. Both these arrangements of direct-coupled and monoset types have their own features with various pros and cons. Centrifugal pumpsets are also available asbelt–driven units.

3.2.1.4 When the speed of the prime mover does not match with the required pump speed for direct coupling or it is considered undesirable and difficult to install a prime mover, for example, a diesel engine, along with the pump inside an open well on a platform as near the source as possible, a belt drive is adopted between the pump and its prime mover. This could enable the user to allow the required distance between the pump and its prime mover, which can also be installed at different levels as necessary and convenient for site conditions.

3.2.1.5 Suitable size of pulleys shall be provided on the shafts of such pumps and their prime movers for arranging the required belt drive. For calculating the size of these pulleys, the speed of the prime mover of the pump shall be known.

3.3 Operating Conditions

3.3.1 *Total Head*

After the required rate of flow of the pump is determined, the user has to find out the total head against which the pump shall have to operate. The total head does not mean only the static vertical height from the lowest water level to the highest delivery point. To this static, the height shall be added loss of head due to friction in foot valve, reflex valve, entire length of suction pipe (both horizontal and vertical), suction bend, delivery sluice valve (if installed), delivery bend and entire length of delivery pipe (both horizontal and vertical) and the velocity head at the delivery point. This frictional head loss depends on the rate of flow of water through a particular size of pipe line and its fitting.

3.3.2 *Operating Head Range*

The minimum total head corresponding to the maximum water level shall also be worked out for determining the operating head range.

4 PIPE FRICTION

4.1 When water or any other liquid moves through a pipe line, the latter offers some resistance to the flow. This resistance depends on the size, type and condition of the pipe and its fittings, and velocity of flow. The head loss due to friction is given in Table 2 and Table 3, also *see* IS 1239 (Part 1) and IS 4985.

4.2 When calculating pipe losses, the allowance shall be included for tees, bends, valves and other fittings and obstructions in a particular pipe line. This is done by adding an allowance of straight pipe equivalent to each fitting or by taking the resistance coefficient for each fitting. The relevant extracts from IS 2951 is given in Annex C.

5 PIPE SIZE SELECTION

5.1 Before installing an agricultural horizontal centrifugal pump, it is very essential to determine the correct selection of the sizes of suction and delivery pipe to be connected to the pump. The prevailing idea that such a pump should always be installed with suction and delivery pipes of the same sizes as pump suction and delivery openings is not sound in every situation. Quite often it involves the farmer in paying higher charges for electrical energy or fuel and oil consumption. In several cases, it makes the pump run with cavitation resulting in reduced discharge, low efficiency and damage to equipment, etc, or at times stop pumping.

5.2 For proper selection of sizes of pipes, Table 1 to Table 3 of IS 10804 shall be referred. An example is described in Annex A of IS 10804 for determination of flow rate, head and selection of pumpsets.

6 FOOT VALVES SELECTION

6.1 Foot valves conforming to IS 10805 shall be selected and installed in vertical position.

6.2 The shape and height of the housing shall be such that even when the valve is fitted on the pipe, it should be possible to raise the disc or discs sufficiently to provide, at any cross-section, a passage of area at least equal to the bore area of the pipe.

6.3 StraKiners shall be robust so as to withstand the normal forces which may come upon while in transit or at the time of installation.

6.4 For satisfactory operation, a foot valve shall not get exposed to atmospheric air when the pump is in operation. It shall also not get submerged in any silt which may gradually get settled down from the wafer on the bottom of the well. It is, therefore, recommended to select the length of vertical portion of the pump suction pipe in such a way that the top of the valve is at least 0.35 m below the minimum water level in the well and the bottom of the foot valve strainer is 0.5 m above the bed (or bottom) and away from sides of the well.

7 FINAL SELECTION OF PUMPS

7.1 Once the rate of flow and the total head is worked out on the basis of the above guidelines, a selection of suitable pump may be made from performance tables or characteristic curves provided by pump manufacturer for various sizes and types of pumps. The pump which has the highest pump efficiency for the capacity and head required shall be selected. The power of the prime mover required for driving the pump shall be fixed from the data given by the pump manufacturer or from Table 4 to Table 7 of IS 10804.

7.2 For selecting a pump, and suction and delivery pipes to be installed with it, the main consideration should be the overall efficiency and minimum consumption of power, either electrical energy or diesel oil. The cost is, of course, a consideration but it shall be viewed in relation to its running cost, maintenance expenses, and losses during shut down for repairs. The Indian Standards are applicable to pumps, motors, diesel engines, petrol/kerosene engines, spark-ignition engines, valves, pipes, and fittings for agricultural pumping sets are given in Annex D.

Table 1 Area Irrigated in Hectares in 8 Hours Pumping

(*Clause* 3.1.2 *and* 3.1.2.1)

Sl No.	**Volume Rate of Flow in l/s**	**Depth of Water in mm**					
		25	50	75	100	125	150
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	0.50	0.058	0.029	0.019	0.014	0.011	0.010
ii)	1.00	0.115	0.058	0.038	0.029	0.023	0.019
iii)	1.25	0.144	0.072	0.048	0.036	0.029	0.024
iv)	1.60	0.184	0.092	0.061	0.046	0.037	0.031
v)	2.00	0.230	0.115	0.077	0.058	0.046	0.038
vi)	2.50	0.288	0.144	0.096	0.072	0.058	0.048
vii)	3.2	0.369	0.184	0.123	0.092	0.074	0.061
viii)	4.0	0.461	0.230	0.154	0.115	0.092	0.077
ix)	5.0	0.576	0.288	0.192	0.144	0.115	0.096
x)	8.0	0.922	0.461	0.307	0.230	0.184	0.154
xi)	10.0	1.152	0.576	0.384	0.288	0.230	0.192
xii)	12.5	1.440	0.720	0.480	0.360	0.288	0.240
xiii)	16	1.843	0.922	0.614	0.461	0.369	0.307
xiv)	20	2.304	1.152	0.768	0.576	0.461	0.384
xv)	25	2.880	1.440	0.960	0.720	0.576	0.480
xvi)	32	3.686	1.843	1.229	1.922	0.737	0.614
xvii)	40	4.608	2.304	1.536	1.152	0.922	0.768
xviii)	50	5.760	2.880	1.920	1.440	1.152	0.960
xix)	65	7.488	3.744	2.496	1.872	1.498	1.248
xx)	80	9.216	4.608	3.072	2.304	1.843	1.536
xxi)	100	11.520	5.760	3.840	2.880	2.304	1.920
xxii)	125	14.400	7.200	4.800	3.600	2.880	2.400

Example 1:

It is required to find volume rate of flow in litres per second for irrigating 0.36 Ha in 8 h pumping for a depth of water of 100 mm.

Procedure:

Enter Table 1 under the column depth of water 100 mm and read 12.5 l/s volume rate flow corresponding to 0.36 Ha.

Example 2:

It is required to find the area irrigated in hectares in 8 h pumping for a volume rate of flow of 100 l/s and depth of water of 75 mm.

Procedure:

Enter Table 1 at the row corresponding to volume rate flow of 100 l/s and read 3.84 hectares under column depth of water 75 mm.

Table 2 Friction Loss in Metres for 10 Metres Long New Steel Galvanized Pipe (C=140)

(*Clause* 4.1)

Sl No.	**Volume Rate of Flow l/s**	**Nominal Pipe Diameter in mm**								
		25	32	40	50	65	80	100	125	150
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
i)	0.50	0.364	—	—	—	—	—	—	—	—
ii)	1.00	1.315	0.341	—	—	—	—	—	—	—
iii)	1.25	1.988	0.516	0.246	—	—	—	—	—	—
iv)	1.60	3.140	0.814	0.388	—	—	—	—	—	—
v)	2.00	—	1.231	0.587	—	—	—	—	—	—
vi)	2.50	—	1.861	0.888	0.282	—	—	—	—	—
vii)	3.2	—	2.940	1.402	0.446	0.126	—	—	—	—
viii)	4.0	—	—	2.120	0.674	0.190	—	—	—	—
ix)	5.0	—	—	3.205	1.019	0.288	—	—	—	—
x)	8.0	—	—	—	2.433	0.687	0.313	—	—	—
xi)	10.0	—	—	—	3.678	1.038	0.474	0.131	—	—
xii)	12.5	—	—	—	—	1.570	0.716	0.198	—	—
xiii)	16	—	—	—	—	2.479	1.131	0.312	0.111	—
xiv)	20	—	—	—	—	3.747	1.710	0.472	0.167	—
xv)	25	—	—	—	—	—	2.585	0.713	0.253	0.106
xvi)	32	—	—	—	—	—	4.083	1.127	0.400	0.167
xvii	40	—	—	—	—	—	—	1.704	0.605	0.252
xvii	50	—	—	—	—	—	—	2.576	0.914	0.381
xix)	60	—	—	—	—	—	—	—	1.281	0.534
xx)	80	—	—	—	—	—	—	—	2.182	0.910
xxi)	100	—	—	—	—	—	—	—	3.299	1.376
xxii	125	—	—	—	—	—	—	—	—	2.081

Table 3 Friction Loss in Metres for 10 Metres Long New Rpvc Pipe (C=150)

(*Clause* 4.1)

Sl No.	**Volume Rate of Flow l/s**	**Nominal Pipe Diameter in mm**								
		40	50	63	75	90	110	125	140	160
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
i)	0.50	0.074	—	—	—	—	—	—	—	—
ii)	1.00	0.268	—	—	—	—	—	—	—	—
iii)	1.25	0.405	0.134	—	—	—	—	—	—	—
iv)	1.60	0.640	0.211	—	—	—	—	—	—	—
v)	2.00	0.967	0.319	—	—	—	—	—	—	—
vi)	2.50	1.462	0.483	0.158	—	—	—	—	—	—
vii)	3.2	2.309	0.762	0.250	0.106	—	—	—	—	—
viii)	4.0	3.491	1.153	0.377	0.160	—	—	—	—	—
ix)	5.0	—	1.742	0.571	0.242	—	—	—	—	—
x)	8.0	—	4.161	1.363	0.577	0.237	—	—	—	—
xi)	10.0	—	—	2.060	0.873	0.358	0.133	—	—	—
xii)	12.5	—	—	3.114	1.319	0.542	0.201	—	—	—
xiii)	16	—	—	4.919	2.084	0.856	0.317	0.172	—	—
xiv)	20	—	—	—	3.151	1.293	0.479	0.260	—	—
xv)	25	—	—	—	—	1.955	0.725	0.392	0.225	0.117
xvi)	32	—	—	—	—	3.089	1.145	0.620	0.355	0.184
xvii)	40	—	—	—	—	—	1.731	0.937	0.537	0.279
xviii)	50	—	—	—	—	—	2.617	1.416	0.812	0.421
xix)	60	—	—	—	—	—	3.668	1.985	1.138	0.590
xx)	80	—	—	—	—	—	—	3.382	1.939	1.006
xxi)	100	—	—	—	—	—	—	—	2.931	1.521
xxii)	125	—	—	—	—	—	—	—	—	2.299

ANNEX A

(*Clause* 3.1.1)

GENERAL GUIDELINES FOR IRRIGATION REQUIREMENTS

A-1 IRRIGATION REQUIREMENTS

Following are given the irrigation requirements of the some of the crops in hard rock and alluvial areas. The irrigation requirements of various crops in the country varies from place to place depending upon the various factors, such as nature of soil, climatic conditions and rainfall. Therefore, the exact water requirements in a particular area should be worked out in consultation with the local agricultural authorities (*see* Table 4 and Table 5).

Table 4 Irrigation Requirements of Some Crops in Hard Rock Areas

(*Clause* A-1)

Sl No.	**Crop**	**Cropping Period in Days**	**Depth of Watering in mm**	**Watering Interval in Days**		**Irrigation Requirements in mm**
				Summer	Winter	
(1)	(2)	(3)	(4)	(5)	(6)	(2)
i)	Rice	100 to 160	75	7	—	800 to 1 600
ii)	Wheat	90 to100	75	—	10 to 15	300 to 450
iii)	Maize	100 to 120	50	7 to 10	—	150 to 300
iv)	Gram	150 to 180	75	—	15 to 20	150 to 300
v)	Sugarcane	360 to 540	120	7 to 10	15 to 20	100 to 2 100

NOTES

1 Sugarcane can be either a 12 month crop or 18 month crop known as *Adsali*.

2 The values given are for reference purposes only.

Table 5 Irrigation Requirements of Some Crops in Alluvial Areas

(*Clause* A-1)

Sl No.	**Crop**	**Cropping Period in Days**	**Depth of Watering in mm**	**Watering Interval in Days**		**Irrigation Requirements in mm**
				Summer	Winter	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Rice	100 to 160	75	7	-	800 to 1 600
ii)	Wheat	120 to160	75	-	10 to 15	300 to 400
iii)	Maize	100 to 120	50	7 to 10	-	150 to 300
iv)	Gram	150 to 180	50	-	15 to 20	100 to 150
v)	Sugarcane	300 to 360	75	7 to 10	15 to 20	600 to 800

NOTE — The values given are for reference purposes only.

ANNEX B

(*Clause* 3.1.2.1)

EXAMPLE FOR DETERMINATION OF QUANTITY OF WATER REQUIRED FOR IRRIGATION AND VOLUME RATE OF FLOW IN RELATION TO THE AREA TO BE IRRIGATED

B-1 The rate of discharge required for certain cropping patterns can be worked out by the following formula:

$$Q = \frac{A.I.28}{R.T.}$$

where

Q = rate of discharge in l/s;

A = area to be irrigated in hectares;

*I = intensity of irrigation in cm;

*R = rotation period in days; and

T = working hours of the pump-set per day.

B-2 For example, if $A = 8$ hectares of wheat, $I = 7.5$ cm, $R = 12$ days and $T = 8$h/day

$$Q \text{ at field level } = \frac{A.I.28}{RT} = \frac{8 \times 7.5 \times 28}{12 \times 8} = 17.5\ l/s$$

Q at pump site = 17.5=1.10 = 19.25 l/s

To take care of 10 percent

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* The value of I and R for different crops shall be obtained.

ANNEXC

(*Clause* 4.2)

HEAD LOSS IN VALVES AND FITTINGS

C-1 The head loss, h_f caused by a fully open valve or fitting during the flow of a liquid may be computed from the formula:

$$h_f = K\frac{v^2}{2g}$$

where

K = resistance coefficient for valve fitting;

v = average velocity in pipe of corresponding diameter in m/s; and

g = acceleration due to gravity in m/s^2.

C-2 Values of resistance coefficient, K for valves and fittings carrying turbulent flow are given in Table 6. In valves carrying laminar flow, the head loss may be assumed to be negligibly small. Flanged valves and fittings should have lower resistance coefficients than screwed valves and fittings. The lower limits in Table 6 should be used with flanged valves and fittings, particularly with sizes above 10 cm nominal diameter.

Table 6 Resistance Coefficients for Valves and Fittings
(*Clause* C-2)

Sl No. (1)	**Description of Valves and Fittings** (2)	**Resistance Coefficient (*K**)** (3)
i)	**Inlets or Reducers**	
ii)	1) Bell mouth	0.04 to 0.05
iii)	2) Square edged	0.47 to 0.56
iv)	**Elbows**	
v)	1) Regular screwed 45° elbow	0.30 to 0.42
vi)	2) Regular screwed 90° elbow	0.55 to 1.50
vii)	3) Regular flanged 90° elbow	0.28 to 0.42
viii)	4) Long radius flanged 45° elbow	0.18 to 0.20
ix)	5) Long radius flanged 90° elbow	0.18 to 0.43
x)	6) Long radius screwed 90° elbow	0.22 to 0.60
xi)	**Bends**	
xii)	1) Screwed return bend, close-pattern	0.50 to 1.50
xiii)	2) Flanged return bend composed of two 90° flanged elbows	
xiv)	a) Regular	0.27 to 0.43
xv)	b) Long radius	0.17 to 0.43
xvi)	**Inward Projecting Pipe**	0.62 to 1.0
xvii)	**Valves**	
xviii)	1) Globe valves	
xix)	a) Composition disc globe valve	0.23 to 5.20
xx)	b) Bevel seat globe valve	6.2 to 7.2
xxi)	c) Plug disc globe valve	7.2 to 10.3
xxii)	2) Gate valves	
xxiii)	a) Wedge disc gate valve	0.05 to 0.19
xxiv)	b) Double disc gate valve	0.08 to 0.13
xxv)	3) Check valves	
xxvi)	a) Swing check valve	0.60 to 2.30
xxvii)	b) Horizontal (left) check valve	8 to 12
xxviii)	c) Ball check valve	65 to 70
xxix)	4) Angle valve	2.10 to 3.10
xxx)	5) Y or blow-off valve	2.9
xxxi)	6) Foot valve	0.3 *Max*
xxxii)	**Standard Screwed Tee**	
xxxiii)	1) Branch blanked-off	0.4
xxxiv)	2) Line blanked-off	
xxxv)	a) Flow from line to branch	0.85 to 1.30
xxxvi)	b) Flow from branch to line	0.92 to 2.15
xxxvii)	**Long Radius Screwed Tee Line Blanked-off**	
xxxviii)	a) Flow from line to branch	0.37 to 0.50
xxxix)	b) Flow from branch to line	0.50 to 0.52
xl)	**Couplings and Unions**	0.02 to 0.07
xli)	**Reducing Bushing and Coupling used as Reducer**	0.05 to 2.0

NOTE — Used as Increaser loss IS up to 40 percent more than that caused by a sudden enlargement.

**k* Decreases with increasing wall thickness of pipe and rounding of edges.

ANNEX D

(*Clause* 7.2)

INDIAN STANDARDS APPLICABLE TO AGRICULTURAL PUMPS

D-1 The following Indian Standards relate to agricultural pumps:

IS No.	*Title*
IS 1239	Steel tubes, tubulars and other wrought steel fittings — Specification:
(Part 1) : 2004	Steel tubes (*sixth revision*);
(Part 2) : 2011	Steel pipe fittings (*fifth revision*)
IS 1536 : 2001	Centrifugally cast (Spun) iron pressure pipes for water, gas and sewage — Specification (*fourth revision*)
IS 1537 : 1976	Vertically cast iron pressure pipes for water, gas and sewage (*first revision*)
IS 1710 : 2021	Vertical turbine pumps — Specification (*third revision*)
IS 3589 : 2001	Steel pipes for water and sewage (168.3 mm to 2 540 mm outside diameter) — Specification (*third revision*)
IS 4038 : 1986	Specification for foot valves for water works purposes (*second revision*)
IS 4985 : 2021	Unplasticized PVC pipes for potable water supplies specification (*fourth revision*)
IS 5120 : 1977	Technical requirements for roto — Dynamic special purpose pumps (*first revision*)
IS 6595	Horizontal centrifugal pumps for clear, cold water — Specification:
(Part 1) : 2018	Agricultural and rural water supply purposes (*fourth revision*);
(Part 2) : 1993	General purpose (other than agricultural and rural water supply) — Specification (*second revision*)
IS 7347 : 1974	Performance of small size spark ignition engines
IS 7538 : 1996	Three — Phase squirrel cage induction motors for centrifugal pumps for agricultural application — Specification (*first revision*)
IS 8034 : 2018	Submersible pumpsets — Specification (*third revision*)
IS 9079 : 2018	Monoset pumps for clear, cold water for agricultural and water supply purposes — Specification (*third revision*)
IS 9137 : 2019	Code for hydraulic performance acceptance tests for centrifugal, mixed and axial flow pumps — Class C (*first revision*)
IS 9694	Code of practice for the selection, installation, operation and maintenance of horizontal centrifugal pumps for agricultural applications:
(Part 2) : 1980	Installation;
(Part 3) : 1980	Operation;
(Part 4) : 1980	Maintenance
IS 10572 : 1983	Methods of sampling for pumps
IS 10804	Recommended pumping systems for agricultural purposes:
(Part 1) : 2018	Surface pumps (*third revision*)
(Part 2) : 2018	Submersible pump sets (*third revision*)
IS 10805 : 1986	Foot-valves reflux valves or non-return valves and bore valves to be used in suction lines of agricultural pumping systems (*second revision*)
IS 10981 : 1983	Code for acceptance tests for centrifugal, mixed flow and axial pumps — Class B
IS 11170 : 1985	Performance requirements for constant speed compression ignition (diesel) engines for agricultural purposes (up to 20 kW)
IS 11346 : 2002	Tests for agricultural and water supply pumps — Code of acceptance (*first revision*)
IS 11501 : 1986	Engine monoset pumps for clear, cold, fresh water for agricultural pumps

ANNEX E

(*Foreword*)

COMMITTEE COMPOSITION

Pump Sectional Committee, MED 20

Organization	*Representative(s)*
Thyssenkrupp Industrial Solutions (India) Private Limited, Mumbai	SHRI A. K. NIJHAWAN **(*Chairperson*)**
Aquasub Engineering, Coimbatore	SHRI C. MURUGESN
Best Engineers Pumps Private Limited, Coimbatore	SHRIMATI C. G. SRIPRIYA SHRI T. PARTHIBAN (*Alternate*)
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Chief Quality Assurance Establishment, Ministry of Defence, New Delhi	SHRI G. ARAVINDAM
Crompton Greaves Consumer Electricals Limited, Ahmednagar	SHRI PARVIN GARJE SHRI PARVIN MURDEKAR (*Alternate*) SHRI ROHIT KANASE (*Young Professional*)
Delhi Jal Board, New Delhi	SHRI PRAVEEN BHARGAVA
Directorate General of Quality Assurance, Ministry of Defence, New Delhi	SHRI LALAJEE DONGRE SHRI R. V. JAIN
Electrical Research and Development Association (ERDA), Vadodara	SHRI RAVI PRAKASH SINGH SHRI GAUTAM BRAHMBHATT (*Alternate*)
Engineers India Limited, New Delhi	SHRI MAHESH GUPTA SHRI DINESH BHATIA (*Alternate*)
GAIL (India) Limited, New Delhi	SHRI SATISH GEDA
Grundfos Pumps India Private Limited, Chennai	SHRI BIBEK SAHA
Havells India Limited, Noida	SHRI ANIL SUKUMAR AKOLE
Hindustan Petroleum Corporation Limited, Mumbai	SHRI ARIJIT SANYAL
Indian Pump Manufacturers Association, Ahemdabad	SHRI YOGESH MISTRI
International Copper Association India, Mumbai	SHRI ABHISHEK DHUPAR SHRI DEBDAS GOSWAMI (*Alternate*)

KSB Pumps Limited, Pune	Shri Uday Joshi Shri Rajesh B. Gote (*Alternate* I) Shri Kiran Shinde (*Alternate* II)
Kirloskar Brothers Limited, Pune	Shri Ravindra Birajdar Shri Vasant Godbole (*Alternate*)
Kirloskar Ebara Pumps Limited, Pune	Shri A. S. Joshi
Mangalore Refinery and Petrochemicals Limited, Mangalore	Shri Adarsh G. A. Shri P. Rajendran (*Alternate*)
Mecon Limited, Ranchi	Shri P. S. Rao Shri A. Gangal (*Alternate*)
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Punjab Agricultural University, Ludhiana	Dr Sunil Garg Dr Sanjay Satpute (*Alternate*)
Rajkot Engineering Association, Rajkot	Shri AnandSavaliya Shri D. R. Shah (*Alternate*)
Scientific and Industrial Testing and Research Centre, Coimbatore	Shri A. M. Selvaraj
Southern India Engineering Manufacturers Association, Coimbatore	Shri K. V. Karthik
Tata Consulting Engineers Limited, Navi Mumbai	Shri A. K. Chaudhary Shri R. Madhavan (*Alternate*)
Wilo Mather and Platt Pumps Private Limited, Pune	Shri Kishor A. Dumbre
In Personal Capacity [*201 Shuchi Heights, Film City Road Malad (East), Mumbai, 400097*]	Shri S. L. Abhyankar
In Personal Capacity (*126-C, Kitchlu Nagar, Ludhiana-141001*)	Dr A. K. Jain
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Scientist ‘B’/Assistant Director
(Mechanical Engineering), BIS

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Aquasub Engineering, Coimbatore	DR C. MUTHU SHRI C. MURUGESASN (*Alternate*)
Best Engineers Pumps India Private Limited, Coimbatore	SHRI S. THANGAPANDI SHRI N. RANADHIVE (*Alternate*)
CSIR-Central Mechanical Engineering Research Institute, Durgapur	SHRI SUBRATA KUMAR MANDAL SHRI ASHOK KUMAR PRASAD (*Alternate*)
Central Equipment and Stores Procurement, Lucknow	SHRI ARUN KUMAR SHRI M. P. KANDOOI (*Alternate*)
Central Ground Water Board, Nagpur	SHRI G. D. OJHA SHRI ASHIS CHAKRABORTY (*Alternate*)
Crompton Greaves Consumer Electricals Limited, Ahmednagar	SHRI PARVIN GARJE SHRI PARVIN MURDEKAR (*Alternate* I) SHRI PRASHANT MAHALE (*Alternate* II)
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Indian pump Manufacturers Association, Ahemdabad	SHRI YOGESH MISTRI SHRI UTKARSH A. CHHAYA (*Alternate* I) SHRI PRABHUDAS PATEL (*Alternate* II)
KSB Pumps Limited, Pune	SHRI ABHAY A. VIRKAR SHRI SANJEEV CHOUDHARY (*Alternate*)
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Kirloskar Brothers Limited, Pune	SHRI RAVINDRA BIRAJDAR SHRI SUDHIR MALI (*Alternate*)
North India Pump Manufacture Association, Jalandhar	SHRI CL GARG SHRI JATIN KALSI (*Alternate*)
Punjab Agricultural University, Ludhiana	DR SUNIL GARG
Rajkot Engineering Association, Rajkot	SHRI ANAND SAVALIYA SHRI D. R. SHAH (*Alternate*)
Roxon Industries, Amritsar	SHRI KIRPAL SINGH
Scientific and Industrial Testing and Research Centre, Coimbatore	SHRI A. M. SELVARAJ
UL India Private Limited, Bengaluru	SHRI V. MANJUNAT
In Personal Capacity (*201 Shuchi Heights, Film City Road Malad (East), Mumbai, 400097*)	SHRI S. L. ABHYANKAR
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This Indian Standard has been developed from Doc No.: MED 20 (19828).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Published by BIS, New Delhi